

## Positive-Voltage Regulators

### Series 78LXXnd

- 3-Terminal Regulators
- Output Current Up to 100mA
- No External Components
- Internal Thermal Overload Protection
- Internal Short-Circuit Limiting
- Direct Replacement for Fairchild  $\mu$ A78L00 Series

#### DESCRIPTION

This series of fixed-voltage monolithic integrated circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power-pass elements to make high-current voltage regulators. Each of these regulators can deliver up to 100mA of output current. The internal limiting and thermal shutdown features of these regulators make them essentially immune to overload. When used as a replacement for a Zener diode-resistor combination, an effective improvement in output impedance can be obtained together with lower-bias current.

Nominal output voltage	Regulator
5V	78L05nd KB5006EH5-4/MB
6V	78L06nd KB5006EH6-4/MB
8V	78L08nd KB5006EH8-4/MB
9V	78L09nd KB5006EH9-4/MB
10V	78L10nd KB5006EH10-4/MB
12V	78L12nd KB5006EH12-4/MB
15V	78L15nd KB5006EH15-4/MB
18V	78L18nd KB5006EH18-4/MB
24V	78L24nd KB5006EH24-4/MB

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#### Absolute maximum ratings over operating temperature range (unless otherwise noted)

	78L05nd thru 78L10nd	78L12nd thru 78L18nd	78L24nd	UNIT
Input voltage	30	35	40	V
Operating free-air, case, or virtual junction temperature range	0 to 150	0 to 150	0 to 150	°C
Storage temperature range	-65 to 150	-65 to 150	-65 to 150	
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds	260	260	260	

#### Recommended operating conditions

Parameter	MIN	MAX	UNIT	
Input voltage, $V_i$	78L05nd	7	20	V
	78L05nd	8	20	
	78L08nd	10.5	23	
	78L09nd	11.5	24	
	78L10nd	12.5	25	
	78L12nd	14.5	27	
	78L15nd	17.5	30	
	78L18nd	20.5	33	
	78L24nd	26.5	39	
Output current, $I_o$		100	mA	
Operating virtual junction temperature, $T_j$	0	125	°C	

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**78L05nd electrical characteristics at specified virtual junction temperature,  $V_I=10V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L05nd			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	4.8	5	5.2	V
	$I_O=1mA$ to 40mA $V_I=7V$ to 20V	0 to 125°C	4.75	5	5.25	
	$I_O=1mA$ to 70mA		4.75	5	5.25	
Input regulation	$V_I=7V$ to 20V	25°C		32	150	mV
	$V_I=8V$ to 20V			26	100	
Ripple rejection	$V_I=8V$ to 18V, $f=120Hz$	25°C	41	49		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		15	60	mV
	$I_O=1mA$ to 40mA			8	30	
Output noise voltage	$f=10Hz-100Hz$	25°C		42		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		3.8	6	mA
		125°C			5.5	
Bias current change	$V_I=8V$ to 20V	0 to 125°C			1.5	
	$I_O=1mA$ to 40mA				0.1	

**78L06nd electrical characteristics at specified virtual junction temperature,  $V_I=11V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L06nd			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	5.75	6	6.25	V
	$I_O=1mA$ to 40mA $V_I=8V$ to 20V	0 to 125°C	5.7	6	6.3	
	$I_O=1mA$ to 70mA		5.7	6	6.3	
Input regulation	$V_I=8V$ to 20V	25°C		35	175	mV
	$V_I=9V$ to 20V			29	125	
Ripple rejection	$V_I=9V$ to 19V, $f=120Hz$	25°C	40	48		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		16	80	mV
	$I_O=1mA$ to 40mA			9	40	
Output noise voltage	$f=10Hz-100Hz$	25°C		46		µV
Dropout voltage		25°C		1.7		V
Bias current		25°C		3.9	6	mA
		125°C			5.5	
Bias current change	$V_I=9V$ to 20V	0 to 125°C			1.5	
	$I_O=1mA$ to 40mA				0.1	

\*Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible.

Thermal effects must be taken into account separately. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1µF capacitor across the output.

\*\*This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Positive-Voltage Regulators

## Series 78LXXnd

**78L08nd electrical characteristics at specified virtual junction temperature,  $V_I=14V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L08nd			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	7.7	8	8.3	V
	$I_O=1mA$ to 40mA $V_I=10.5V$ to 23V	0 to 125°C	7.6	8	8.4	
	$I_O=1mA$ to 70mA		7.6	8	8.4	
Input regulation	$V_I=10.5V$ to 23V	25°C		42	175	mV
	$V_I=11V$ to 23V			36	125	
Ripple rejection	$V_I=13V$ to 23V, $f=120Hz$	25°C	37	46		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		18	80	mV
	$I_O=1mA$ to 40mA			10	40	
Output noise voltage	$f=10Hz-100Hz$	25°C		54		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		4	6	mA
		125°C			5.5	
Bias current change	$V_I=11V$ to 23V	0 to 125°C			1.5	
	$I_O=1mA$ to 40mA				0.1	

**78L09nd electrical characteristics at specified virtual junction temperature,  $V_I=16V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L09nd			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	8.6	9	9.4	V
	$I_O=1mA$ to 40mA $V_I=12V$ to 24V	0 to 125°C	8.55	9	9.45	
	$I_O=1mA$ to 70mA		8.55	9	9.45	
Input regulation	$V_I=12V$ to 24V	25°C		45	175	mV
	$V_I=13V$ to 24V			40	125	
Ripple rejection	$V_I=15V$ to 25V, $f=120Hz$	25°C	38	45		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		19	90	mV
	$I_O=1mA$ to 40mA			11	40	
Output noise voltage	$f=10Hz-100Hz$	25°C		58		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.1	6	mA
		125°C			5.5	
Bias current change	$V_I=13V$ to 24V	0 to 125°C			1.5	
	$I_O=1mA$ to 40mA				0.1	

\*Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible.

Thermal effects must be taken into account separately. All characteristics are measured with a 0.33μF capacitor across the input and a 0.1μF capacitor across the output.

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## Positive-Voltage Regulators

## Series 78LXXnd

**78L10nd electrical characteristics at specified virtual junction temperature,  $V_I=17V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L10nd			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	9.6	10	10.4	V
	$I_O=1mA$ to 40mA $V_I=13V$ to 25V	0 to 125°C	9.5	10	10.5	
	$I_O=1mA$ to 70mA		9.5	10	10.5	
Input regulation	$V_I=13V$ to 25V	25°C		51	175	mV
	$V_I=14V$ to 25V			42	125	
Ripple rejection	$V_I=15V$ to 25V, $f=120Hz$	25°C	37	44		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		20	90	mV
	$I_O=1mA$ to 40mA			11	40	
Output noise voltage	$f=10Hz-100Hz$	25°C		62		$\mu V$
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.2	6	mA
		125°C			5.5	
Bias current change	$V_I=14V$ to 25V	0 to 125°C			1.5	
	$I_O=1mA$ to 40mA				0.1	

**78L12nd electrical characteristics at specified virtual junction temperature,  $V_I=19V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L12nd			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	11.5	12	12.5	V
	$I_O=1mA$ to 40mA $V_I=14V$ to 27V	0 to 125°C	11.4	12	12.6	
	$I_O=1mA$ to 70mA		11.4	12	12.6	
Input regulation	$V_I=14V$ to 27V	25°C		55	250	mV
	$V_I=16V$ to 27V			49	200	
Ripple rejection	$V_I=15V$ to 25V, $f=120Hz$	25°C	37	42		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		22	100	mV
	$I_O=1mA$ to 40mA			13	50	
Output noise voltage	$f=10Hz-100Hz$	25°C		70		$\mu V$
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.3	6.5	mA
		125°C			6	
Bias current change	$V_I=16V$ to 27V	0 to 125°C			1.5	
	$I_O=1mA$ to 40mA				0.1	

\*Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible.

Thermal effects must be taken into account separately. All characteristics are measured with a 0.33 $\mu F$  capacitor across the input and a 0.1 $\mu F$  capacitor across the output.

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## Positive-Voltage Regulators

## Series 78LXXnd

**78L15nd electrical characteristics at specified virtual junction temperature,  $V_I=23V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L15nd			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	14.4	15	15.6	V
	$I_O=1mA$ to 40mA $V_I=17.5V$ to 30V	0 to 125°C	14.25	15	15.75	
	$I_O=1mA$ to 70mA		14.25	15	15.75	
Input regulation	$V_I=17.5V$ to 30V	25°C		65	300	mV
	$V_I=19V$ to 30V			58	250	
Ripple rejection	$V_I=18.5V$ to 28.5V, $f=120Hz$	25°C	34	39		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		25	150	mV
	$I_O=1mA$ to 40mA			15	75	
Output noise voltage	$f=10Hz-100Hz$	25°C		82		$\mu V$
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.6	6.5	mA
		125°C			6	
Bias current change	$V_I=19V$ to 30V	0 to 125°C			1.5	
	$I_O=1mA$ to 40mA				0.1	

**78L18nd electrical characteristics at specified virtual junction temperature,  $V_I=26V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L18nd			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	17.3	18	18.7	V
	$I_O=1mA$ to 40mA $V_I=20.5V$ to 33V	0 to 125°C	17.1	18	18.9	
	$I_O=1mA$ to 70mA		17.1	18	18.9	
Input regulation	$V_I=20.5V$ to 33V	25°C		70	360	mV
	$V_I=22V$ to 33V			64	300	
Ripple rejection	$V_I=21.5V$ to 31.5V, $f=120Hz$	25°C	32	36		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		27	180	mV
	$I_O=1mA$ to 40mA			19	90	
Output noise voltage	$f=10Hz-100Hz$	25°C		89		$\mu V$
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.7	6.5	mA
		125°C			6	
Bias current change	$V_I=22V$ to 33V	0 to 125°C			1.5	
	$I_O=1mA$ to 40mA				0.1	

\*Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible.

Thermal effects must be taken into account separately. All characteristics are measured with a 0.33 $\mu F$  capacitor across the input and a 0.1 $\mu F$  capacitor across the output.

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### Series 78LXXnd

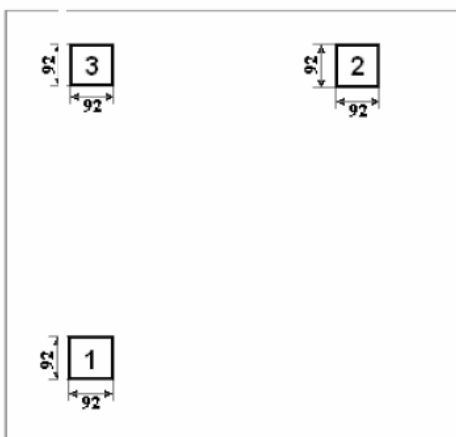
**78L24nd electrical characteristics at specified virtual junction temperature,  $V_I=32V$ ,  $I_O=40mA$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78L24nd			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	23	24	25	V
	$I_O=1mA$ to 40mA $V_I=26.5V$ to 39V	0 to 125°C	22.8	24	25.2	
	$I_O=1mA$ to 70mA		22.8	24	25.2	
Input regulation	$V_I=26.5V$ to 39V	25°C		95	480	mV
	$V_I=29V$ to 39V			78	400	
Ripple rejection	$V_I=27.5V$ to 37.5V, $f=120Hz$	25°C	30	33		dB
Output regulation	$I_O=1mA$ to 100mA	25°C		41	240	mV
	$I_O=1mA$ to 40mA			28	120	
Output noise voltage	$f=10Hz-100Hz$	25°C		97		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.8	6.5	mA
		125°C			6	
Bias current change	$V_I=28V$ to 39V	0 to 125°C			1.5	
	$I_O=1mA$ to 40mA				0.1	

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**Pad Location 78L00 n.d.**



Wafer Thickness: 460±30μm (or 350±30μm,  
280±30μm)  
Top metal: AlSi  
Backside metal: - (or Ti-Ni (V)-Ag)  
Wafer size: 100 mm

Chip size 0.75 x 0.8 mm

Pad No	Pad Name	X(μm)	Y(μm)
1	GROUND	110	110
2	INPUT	640	700
3	OUTPUT	110	700